

**PROPOSAL TO ADD A MINOR IN ASTROPHYSICS
in the School of Earth and Space Exploration**

This Package Includes Materials Prepared as Proposal to add a Minor in Astrophysics.

All changes requested to take effect Fall 2010

PROPOSAL CONTACT INFORMATION:

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To: Sid Bacon
From: Kip Hodges, Director, School of Earth and Space Exploration
Date: September 11, 2009



Re: New Undergraduate Programs and Concentrations in SESE

We have been very busy on a wide array of new undergraduate educational initiatives in SESE, and I write today in support of the packages that are being transmitted to the College today. They include a new BA degree in Earth and Environmental Studies, a completely redesigned BS degree in Earth and Space Exploration (which offers a variety of concentrations to tune the program to the interests of prospective majors), and a Minor in Astrophysics. All of these programs have been designed by faculty committees and have been thoroughly vetted over multiple faculty meetings. These new programs – especially the BA program – will be widely attractive to new ASU students, and I would be extremely surprised if these initiatives do not lead to at least a doubling or perhaps even tripling of the number of SESE majors within two or three years with proper marketing.

The programs will require the launch of a variety of new upper and lower division subjects, and I am pleased to report that our faculty are extremely enthusiastic about teaching these subjects. An added bonus is that several of the lower division subjects should also appeal to non-majors as exciting and timely science electives. We intend to maintain all of our existing core subjects in the near term, so the new subjects will sap resources from our already-overtaxed TA pool and will add to faculty teaching loads. While I'd like to be able to count on the College for some additional resources to alleviate some of the stresses as we launch these initiatives, most of the stresses are likely to be concentrated in the first year or two as we are spinning up. As you know, we are poised to grow quickly in faculty size, so I think that we will only have to expand teaching loads temporarily as these new hires work into our system. Regarding non-faculty teaching resources, we stand ready to work with you to achieve the most fiscally responsible path to serving the students in these new programs. We are, for example, very enthusiastic about creating fully on-line laboratories for the new lower-division subjects. With some funds for web development in the first year or two, for example, we may have relatively low resource costs for these subjects in steady state.

I hope you agree that these initiatives bring exciting new options for the students of ASU.

DEFINITION

These are the minimum requirements for approval. Individual undergraduate minors may have additional requirements.

A minor is an approved, coherent focus of academic study in a single discipline, other than the student's major, involving substantially fewer hours of credit than a corresponding major. Certain major and minor combinations may be deemed inappropriate either by the college or department of the major or minor. Inappropriate combinations include (but would not be limited to) ones in which an excessive number of courses in the minor are simultaneously being used to fulfill requirements of the student's major. (2002-03 General Catalog)

A minor:

- Requires a minimum of 15 semester hours of which at least 9 semester hours must be upper division
- Is not intended for students pursuing a major in the department which offers the minor

PROPOSAL PROCEDURES CHECKLIST

Before academic units can advertise minors or include them in their offerings as described in the university catalogs, they must be recommended for approval by the Curriculum and Academic Programs Committee and approved by the appropriate Vice Provost.

A complete proposal should include:

- 1. A supporting letter from the chair of the academic units verifying that:
 - A. The proposed minor has been reviewed and has received faculty approval through appropriate governance procedures in the unit.
 - B. The unit has the resources to support the minor as presented in the proposal, without impacting core course resources.
- 2. A supporting letter from the office of the supervising dean verifying that the minor has been reviewed and has received approval through appropriate governance procedures in the college.
- 3. A statement concerning demand for the program (student/community/market).
- 4. A description of the requirements for this minor. Be specific in listing required courses and specify the total minimum number of hours required for the minor.
 - Are any new courses required? If so, provide course syllabi and Proposal for Curriculum Action forms.
- 5. A description of advising procedures as well as measures for verification of completion of the minor.
- 6. A minimum residency requirement: How many hours of the minor must be ASU credit?
- 7. Attach other information that will be useful to the review committees and the Office of the Provost.

ASTROPHYSICS MINOR

1. PURPOSE AND NATURE OF THE PROGRAM

The Astrophysics minor program comprises 20 credit hours of courses in astronomy and astrophysics that will provides a comprehensive training in those fields. It is designed to be taken by anyone with the requisite physics and mathematics skills.

2. LEARNING OUTCOMES

Students completing the minor in Astrophysics will gain fundamental background knowledge in the theoretical modeling and observational techniques of galactic and stellar astronomy, extragalactic astronomy and cosmology. Students completing the minor will acquire the ability to think critically about scientific problems, and to reduce complex problems to their most important attributes and to design experiments, observations and/or theoretical models to address those attributes.

3. NEED FOR THE PROGRAM

ASU had traditionally offered a minor in astrophysics through the Department of Physics and Astronomy, but with the advent of SESE, the required courses are no longer offered in the now Department of Physics. Restoration of the Astrophysics minor must be achieved through SESE.

There is demand for a minor in astrophysics, especially from Physics students who are just interested in astronomy and astrophysics, and especially from students who may plan to pursue a graduate career in these fields but choose the Physics BS. There is also demand from engineering students in MAE who plan to pursue careers in, e.g., space hardware, and wish to learn more about the space environment and astrophysical processes.

4. REQUIREMENTS FOR THE MINOR

A total of **20** credit hours are required for the minor.

The following courses are required for the minor, adding up to 12 credit hours.

- * AST 321 Intro to Planetary and Stellar Astrophysics (3)
- * AST 322 Intro to Galactic and Extragalactic Astrophysics (3)
- * AST 421 Astrophysics I (3)
- * AST 422 Astrophysics II (3)

Students must also choose one of the following options for the additional 8 credit hours

Option #1:

- * SES 101 Earth / Solar System / Universe I (3)
- * SES 102 Earth / Solar System / Universe Lab I (1)

- * SES 103 Earth / Solar System / Universe II (3)
- * SES 104 Earth / Solar System / Universe Lab II (1)

Option #2:

- * AST 111 Intro Solar System Astronomy (3)
- * AST 113 Astronomy Laboratory I (1)
- * AST 112 Intro Stars Galaxies & Cosmology (3)
- * AST 114 Astronomy Laboratory II (1)

Option #3:

At least 8 credit hours of SES or AST upper division electives;
these may include (but are not limited to):

- * AST 494 Astrophysics Seminar (1)
- * SES 311 Essentials of Astrobiology (3)
- * AST/SES 498/598 Astronomical Instrumentation and Data Analysis (3)

5. ADVISING PROCEDURES

The DARS system will be used for tracking student progress and verifying completion of the Minor. All students will be assigned and academic advisor.

6. PRIMARY FACULTY PARTICIPANTS

All current "astronomy" faculty [Desch, Groppi, Malhotra, Rhoads, Scannapieco, Starrfield, Timmes, Windhorst, and Young] can teach any of the courses AST111/112/321/322/421/422/494. Dr. Scowen has traditionally taught AST/SES498/598. The remaining optional courses described above are taught by a variety of faculty within SESE.

6. MINIMUM RESIDENCY REQUIREMENT

12 units in the Minor